portions of specimens exposed more than four weeks to the direct rays of the sunlight proved most satisfactory. They exhibited all the stages of pigment formation suggested by the various theories, epidermal cells in which the pigment was densest around the nucleus with the nucleus in a shrinking condition, confirming the theory of Jarisch and others; further intercellular pigment masses with amœboid processes situated between mucous cells and glands similar to the melanoblasts observed by Becarri and Brinkmann. Also pigmented masses along the blood vessels of the gills undoubtedly stimulated by the respiratory changes in the circulation of the blood, but the largest pigment mass consisted of innumerable spherical bodies of accumulated melanin granules which covered the epidermis of the mantle and were held by a layer of mucus exuded from the cells and forming the ultimate fate of the pigmentation process. In specimens that had been returned to the dark after several weeks most of the pigment had disappeared, and where present was confined to the original pigment cells of the epidermis, largely along the mantle edge, with scattered disintegration products of pigment granules throughout the epidermis.

Though the work is still tentative, I have come to the conclusion that animal pigmentation is probably a protein formation due to an enzyme which is circulating in the blood and present in the nucleoplasm of all secreting cells. This, of course, could only be proved by chemical analysis. In some cases the leucocytes are transformed into specific chromatophores or melanoblasts, capable of amœboid motion; in others the deposition of pigment has become a hereditary factor, as, *e. g.*, in the choroid coat of the eye or the ink-bag of the squid; in still other cases pigmentation is stimulated into action by internal metabolic processes as well as by external conditions of light, temperature and atmospheric gases. In the case of the oyster light is the chief factor in the stimulation of pigment, which is the result of protective reaction against abnormal conditions. But this reaction is in my judgment not merely chemical, it is preeminently biological and under the control of nuclear determinants.

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SPECIAL ARTICLES

SUPPRESSION AND LOSS OF CHARACTERS IN SUNFLOWERS

Helianthus and *Œnothera* are very little related, yet in breeding and studying sunflowers one is constantly reminded of phenomena previously recorded in connection with evening primroses. The parallelism in variation is such that one is led to ask, what, precisely, do we mean by a "new" variation? A "new variety" can be easily defined as a distinguishable type arising in a species, and either "new" in the sense of being newly discovered, or (as we believe to have been true of the red sunflower) actually originating within the period of our knowledge. We have thought it highly satisfactory to be able to list[1] instances of newly occurring varieties or mutations, with some suggestions regarding their proximate causes, but it must not be forgotten that in so doing we have gone only a little way below the surface. If many plants, of widely different families, produce entirely analogous variations, it must be true that there is something in the constitution of the whole series which makes the apparent accidents inevitable. One is reminded of the occasion when Whistler made an exceptionally good joke, and Oscar Wilde, who was present, remarked, "I wish I had made that joke!" Whistler replied, "My dear fellow, don't worry, *you will make it.*" So might the *Gaillardia* have said to the sunflower, five years ago, though without the sarcastic intent.

The commonest of all variations results from the loss of a character, but this may be due to latency, or to the dropping out of a determiner. In sunflowers, the "primrose" varieties, with pale primrose-colored rays, offer a typical case; another, of which a single example occurred in

[1] Gates, *Quart. Jour. Micr. Science*, Feb., 1914, pp. 562–563, gives an excellent tabulation of the principal types of mutation.

our cultures, is without rays. Both variations are fairly common among the Compositæ, and the characters may become specific, as in the rayless species *Gaillardia suavis;* or even generic, as in *Hymenopappus,* which has no rays.[2] Messrs. Sutton & Sons, of Reading, England, inform me that they introduced the primrose-rayed variety of the common sunflower in 1889; it had occurred as a sport from the ordinary form a few seasons before. We have shown by breeding that it is recessive to the orange-rayed (normal) form, and segregates in a normal Mendelian manner. On August 19, 1913, my wife and I found near Goodview, Colorado, a lot of wild sunflowers (*H. annuus* subsp. *lenticularis*) growing in very dry ground by the roadside, and consequently very small. In the midst of the normally colored plants was a single example of a primrose-rayed variety,[3] which I dug up with great difficulty, owing to the very hard dry soil, and removed to the garden, to be used in crosses. Here, in this poor little starved plant, we had what might have been the origin of a whole series of primrose-rayed varieties, greatly adding to the beauty and interest of gardens, had not Sutton obtained an analogous form years before. As it is, we hoped to see some interesting modifications through the introduction of the wild strain into the cultivated group.

On the same day that we found the wild *primulinus,* we also found a form[4] of *H. aridus* Rydberg with lemon-yellow rays, a shade intermediate between orange and primrose. This *H. aridus* is treated by Nelson as a synonym of *H. petiolaris,* but this is certainly an error. Its characters strongly suggest that it is a *lenticularis* × *petiolaris* hybrid. It is not merely *lenticularis* growing in dry ground, for that plant in the driest places does not become *aridus.*

In the cases just cited, we seem to be concerned with the dropping out of a determiner, but we have other examples which will not bear this interpretation. Repeated experience in breeding has shown that the *coronatus* character (red on the rays) is a typical Mendelian dominant, but its *expression* is very variable. We noted in the case of the original plant, that the last small heads of the season were almost entirely yellow rayed. We have also observed that heterozygous plants may have very richly colored rays. Mr. Tufnail, of the

2 *Leucampyx newberryi* Gray and *Hymenopappus radiatus* Rose are rayed *Hymenopappus,* though the *Leucampyx* retains the primitive character of disc-bracts, while otherwise almost identical with *H. radiatus.* Nelson states that *Leucampyx* has no pappus, but this is an error; it has pappus-scales like those of *Hymenopappus.*

3 *Helianthus lenticularis* var. *primulinus,* nov. Rays primrose color; disc-corollas very pale yellowish-green or greenish-yellow, the lobes faintly tipped with reddish; disc-bracts dark at end; stigmatic branches pink, dark at end, the general effect to the naked eye pale lavender. Leaves very broad, thick, hoary. In the garden variety (*annuus* var. *primulinus*), the plant compared being one extracted in the F_2 from *primulinus* × *coronatus,* we find the stigmatic branches almost black, while the lobes of the disc-corollas have the apical part, and the margins below that, dark lake; even the pappus scales are deep lake. Hence the general effect of the disc is very black, very different from the normal form. We have obtained, however, another garden variety (*H. annuus* var. *selene,* nov.) with the disc pale greenish yellow; rays light primrose; stigmatic branches pale primrose. The plant is about 5 feet high; stem without purple; leaves large; involucral bracts long-pointed, lateral cilia short and not conspicuous.

4 *Helianthus aridus* var. *citrinus,* nov. Rays lemon yellow. It does not follow, because there are at least three degrees of yellowness (corresponding approximately to Ridgway's cadmium yellow, lemon chrome and picric yellow) in sunflower rays, that there are three kinds of pigment. Rays of *H. annuus* var. *primulinus,* which are picric yellow, on drying for the herbarium turn brilliant light lemon yellow. Examining rays of garden sunflowers under the microscope, it is seen that in the normal (cadmium yellow) and lemon (lemon chrome) forms the pigment nearly fills the cells, and is differently colored in the two. In the primrose variety, however, the pigment is *much less abundant,* as well as paler. It is perhaps probable that the pigment of the primrose variety is quite the same as that of the lemon one, appearing paler only because not massed; there are then two types with regard to its density or abundance, the combinations of these producing three varieties.

Sutton firm, tells me that in England the amount of red shown by the plants differs greatly according to the soil. Even in the same head, however, we may find remarkable extremes. Sometimes the orange rays are irregularly flecked with red, as if some one had been painting near by, and had accidentally touched them here and there. One plant (F_2 from *coronatus* $\times$ *primulinus*) had orange rays, the basal half strongly suffused with red; disc before flowering pale yellow (due to color of disc-bracts), except a small triangular section of rather light purple, its apex not quite reaching the center of the disc. A still more singular head (*coronatus* $\times$ *annuus*), with a dark disc 44 mm. in diam., and rays 50 mm. long, had the 27 rays variously colored, in order, as follows: (R = deep chestnut red, rather streaky, on basal half or more; Y = orange-yellow, with practically no red; M = medium, between these extremes). Y R R R M M M Y Y Y R R Y Y Y Y R R R R R R M Y Y Y Y. Are we to suppose that in these cases irregularities have arisen in the course of the somatic cell-divisions, the whole plant being in an unstable condition as regards the factor for red? Could cytological studies throw any light on this?

A certain analogy may perhaps be found in the occurrence of fasciation in our *lenticularis caronatus* $\times$ *annuus* plants. A very fasciated plant, crossed with presumably normal ones through the agency of the bees, gave seven F_1 plants, of which two showed fasciated heads, but others exhibited variously split and divided rays. Here it seemed that a weakness existed, but in some cases only found expression in the most peripheral parts, and to a relatively slight degree. Another set of plants with a fasciated parent showed what looked like supernumerary rays, but they were actually extra elongated lobes borne on the ray florets.

Davis and Salmon[5] have described etiolated or sterile dwarfs which arose in *Œnothera* and *Humulus*. We have obtained the same thing in sunflowers, from heterozygous *coronatus*. A family of thirteen plants had the third, fifth, seventh, ninth, eleventh, twelfth and thirteenth dwarf and mostly etiolated. With the best care we could give them, all died but two, though the normal members of the series, growing in the same row, showed no evidence of adverse conditions. The two survivors (Nos. 12 and 13) finally flowered at a height of 30 and 27 inches, respectively;[6] one (12) had the disc orange; the rays, bright lemon suffused with orange, long and slender, curled. The other (13) had the disc dark; the rays very short, suffused with red at base. No. 12 produced much pollen; but 13 had the anthers all aborted, shrivelled up within the corolla tube, producing only a very little pollen, presumably not viable. The pistils of 13 were fully exserted and normal, but nothing could be seen of anthers or pollen except on dissection.

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5 B. M. Davis, *American Naturalist*, Aug., 1913, p. 453 et seq. E. S. Salmon, *Jour. of Genetics*, February, 1914, p. 195.

6 Certain species of perennial sunflowers (*H. filiformis, ciliaris* and *cinereus*) are normally as small as this.

SOCIETIES AND ACADEMIES

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

At a special meeting of the society held March 24 at the National Museum, Dr. Albert Hale, of the Pan-American Union, addressed the society on "Modern Argentina," illustrating his remarks with lantern slides. The ethnical elements of Argentina may be best studied in immigration statistics. Of the total number of immigrants arriving in 1857–1912, 4,248,355, more than one half, or 2,133,508, were Italians. The Spaniards numbered scarcely more than half as many as the Italians, or about 1,298,122. Other European races were represented by much smaller numbers than these. The French numbered only 206,912 and the Russians, 136,659. Next to these came the Syrians, of western Asia, with 109,234; then the Austrians and Germans, with 80,736 and 55,068, respectively. The Britons numbered nearly as many as the Germans, or 51,660. The Swiss, Belgians and Portuguese, numbered about 20,000 or 30,000 each; the Danes and Dutch, 7,000 each; the North Americans, 5,500; the Swedes, 1,700, and others 79,251. The relative proportions of Italians and Spaniards arriving during 1912 were the same